

PATENT APPLN. NO. 10/540,624
SUBMISSION UNDER 37 C.F.R. § 1.114

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IN THE CLAIMS:

1. (currently amended) A layered product having first and second opposed surfaces and comprising:

a thermosetting resin layer forming the first opposed surface of the layered product,

a thermoplastic resin layer forming at least part of the second opposed surface of the layered product, and

reinforcing continuous filaments arranged in one direction in said layered product and existing in both the thermosetting resin layer and the thermoplastic resin layer,

wherein

the thermoplastic resin layer and the thermosetting resin layer are integrated at a continuous rugged interface between said layers,

said continuous rugged interface having a structure such that some of said reinforcing continuous filaments parallel to the surface first and second opposed surfaces of the layered product extend through said continuous rugged interface and exist in the resin of said thermoplastic resin layer and also exist in the resin of said thermosetting resin layer, and

wherein

the thickness of an area in said thermoplastic resin layer

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between an outermost reinforcing continuous filament with respect to the ~~surface of the thermoplastic resin layer~~ second opposed surface and an innermost reinforcing continuous filament with respect to the ~~surface of the thermoplastic resin layer~~ second opposed surface is 10 μm or more.

2. (canceled)

3. (previously presented) A layered product, according to claim 1, wherein the glass transition temperature of the resin constituting said thermosetting resin layer is 60°C or higher.

4. (canceled)

5. (previously presented) A layered product, according to claim 1, wherein said thickness is in the range of 10 μm to 1,000 μm .

6. (currently amended) A layered product, according to claim 1, wherein the surface area of said ~~thermoplastic resin layer~~ second opposed surface accounts for 0.1 to 50% of the surface area of the ~~molded object~~ layered product.

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7. (currently amended) A molded object comprising two layered products each of which is defined in claim 1, wherein the ~~face of~~ ~~said thermoplastic resin layer~~ second opposed surface of one of the two layered products and the ~~face of~~ ~~said thermoplastic resin layer~~ second opposed surface of the other layered product of the two layered products are positioned on the opposing surfaces of said molded object opposite to each other.

8. (previously presented) A layered product, according to claim 1, wherein the bonding strength of the layered product is 6 MPa or higher at room temperature.

9 - 10. (canceled)

11. (previously presented) A layered product, according to claim 1, wherein the reinforcing continuous filaments are carbon fibers.

12. (previously presented) A layered product, according to claim 1, wherein said thermosetting resin is a resin mainly composed of an epoxy resin.

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13. (previously presented) A layered product, according to claim 1, wherein said thermoplastic resin is at least one resin selected from the group consisting of polyamide-based resins, polyester-based resins, polycarbonate-based resins, styrene-based resins, EVA resin, urethane-based resins, acrylic resins, polyolefin-based resins and PPS-based resins.

14. (withdrawn) A process for producing a layered product as set forth in claim 1 or 9, comprising the steps of disposing a base material for thermal bonding composed of a thermoplastic resin, on a surface of a prepreg obtained by impregnating groups of reinforcing fibers consisting of numerous continuous filaments with a thermosetting resin not yet set, and impregnating said groups of reinforcing fibers with the thermoplastic resin of said base material for thermal bonding, during the setting reaction of said thermosetting resin or during preheating before the setting reaction.

15. (withdrawn) A process for producing a layered product, according to claim 14, wherein a pressing pressure of 0.1 MPa or higher is caused to act when said groups of reinforcing fibers are impregnated with the thermoplastic resin.

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16. (previously presented) An integrated molded object which comprises a first member composed of a layered product as set forth in claim 1 and a second member composed of another structural member, wherein the first member and the second member are bonded to each other through said thermoplastic resin layer in said first member.

17. (currently amended) An integrated molded object, according to claim 16, wherein said second member is at least one member selected from the group consisting of a member composed of a layered product having first and second opposed surfaces and comprising:

a thermosetting resin layer forming the first opposed surface of the layered product,

a thermoplastic resin layer forming at least part of the second opposed surface of the layered product, and

reinforcing continuous filaments arranged in one direction in said layered product and existing in both the thermosetting resin layer and the thermoplastic resin layer,

wherein

the thermoplastic resin layer and the thermosetting resin layer are integrated at a continuous rugged interface between said

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layers,

said continuous rugged interface having a structure such that some of said reinforcing continuous filaments parallel to the surface first and second opposed surfaces of the layered product extend through said continuous rugged interface and exist in the resin of said thermoplastic resin layer and also exist in the resin of said thermosetting resin layer, and

wherein

the thickness of an area in said thermoplastic resin layer between an outermost reinforcing continuous filament with respect to the surface of the thermoplastic resin layer second opposed surface and an innermost reinforcing continuous filament with respect to the surface of the thermoplastic resin layer second opposed surface is 10 μ m or more;

a member composed of a thermoplastic resin composition; and a member composed of a metallic material.

18. (withdrawn) A process for producing an integrated molded object as set forth in claim 16, comprising the step of integrating said first member and said second member with each other, by at least one integration method selected from the group consisting of thermal welding, vibration welding, ultrasonic welding, laser

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welding, insert injection molding and outsert injection molding.

19. (original) An integrated molded object, according to claim 16, which is a part member or a housing of an electric or electronic apparatus, an office automation apparatus, a household electric appliance or a medical apparatus.

20. (original) An integrated molded object, according to claim 16, which is a part member or a panel of a motor vehicle, a two-wheeler, a bicycle, an aircraft or an architecture.

21. (withdrawn) A base material for thermal bonding of adhering members of identical and/or different kinds, wherein the bonding strength (S) of the test piece of the layered product defined in the specification based on ISO4587 is 5.0 MPa or higher at a temperature of 100°C and 1.0 MPa or lower at a temperature of 200°C.

22. (withdrawn) A base material for thermal bonding, according to claim 21, wherein where the bonding strength at a temperature t (°C) is S_t (MPa) and the bonding strength at a temperature ($t + 30$) (°C) is $S_{(t+30)}$ (MPa), the temperature t satisfying the relation of

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$St \geq 3 \times S_{(t+30)}$ is from 100°C to 200°C.

23. (withdrawn) A base material for thermal bonding, according to claim 21, wherein said base material is composed of a copolyamide-based resin composition.

24. (withdrawn) A base material for thermal bonding, according to claim 23, wherein said copolyamide contains ternary copolyamide 6/66/610 as a component.

25. (withdrawn) A base material for thermal bonding, according to claim 21, wherein said base material is in a form of a nonwoven fabric or film having a unit weight of 1 to 100 g/m².

26. (withdrawn) A process for producing a layered product, according to claim 14, wherein said base material for thermal bonding is a base material for thermal bonding comprising adhering members of identical and/or different kinds, wherein the bonding strength (S) of the test piece of the layered product defined in the specification based on ISO4587 is 5.0 MPa or higher at a temperature of 100°C and 1.0 MPa or lower at a temperature of 200°C.

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27. (withdrawn) An electromagnetic-shielding molded object, obtained by integrating a first structural member composed of a resin composition having groups of conductive fibers consisting of numerous continuous filaments arranged therein and a second structural member composed of a thermoplastic resin composition, wherein the electromagnetic shielding property of said first structural member at a frequency of 1 GHz measured according to the KEC method is 40 dB or more.

28. (withdrawn) An electromagnetic-shielding molded object, according to claim 27, wherein said first structural member is a layered product comprising (1) a thermosetting resin layer, a thermoplastic resin layer and groups of reinforcing fibers consisting of numerous continuous filaments, wherein said thermosetting resin layer and said thermoplastic resin layer are integrated at the interface between these layers in such a manner that the resin of said thermosetting resin layer and the resin of said thermoplastic resin layer are formed to be rugged at the interface; a set of filaments among said groups of reinforcing fibers is kept in contact with at least the resin of said thermosetting resin layer while the other set of filaments among said groups of reinforcing fibers is kept in contact with at least

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the resin of said thermoplastic resin layer; and the face of said thermoplastic resin layer opposite to said interface is positioned on the surface of said molded object, or (2) a thermosetting resin composition having groups of reinforcing fibers consisting of numerous continuous filaments arranged in a thermosetting matrix resin and a film composed of a thermoplastic resin composition formed at least on a portion of the surface of said thermosetting resin composition, wherein the normal bonding strength defined in the specification between the layered product and another molded object bonded through said film is 10 MPa or higher at a temperature of 40°C and lower than 10 MPa at a temperature of 140°C; and wherein the numerous continuous filaments constituting said groups of reinforcing fibers are carbon fibers.

29. (withdrawn) An electromagnetic-shielding molded object, according to claim 27, wherein the flexural modulus of said first structural member based on ASTM D790 is 8 GPa or more as the test piece defined in the specification.

30. (withdrawn) An electromagnetic-shielding molded object, according to claim 27, wherein the average thickness of said first structural member is 1.6 mm or less.

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31. (withdrawn) An electromagnetic-shielding molded object, according to claim 27, wherein when the molded object is observed from outside, a pattern based on an arranged state of said numerous continuous filaments can be observed.

32. (withdrawn) An electromagnetic-shielding molded object, according to claim 27, wherein the resin composition in said first structural member is a thermosetting resin.

33. (withdrawn) An electromagnetic-shielding molded object, according to claim 27, wherein the resin composition in said first structural member is a thermoplastic resin.

34. (withdrawn) An electromagnetic-shielding molded object, according to claim 27, wherein the thermoplastic resin composition of said second structural member contains discontinuous carbon fibers; the weight average fiber length L_w of said carbon fibers is 0.4 mm or more; and the ratio L_w/L_n of the weight average fiber length L_w to the number average fiber length L_n is from 1.3 to 2.0.

35. (withdrawn) An electromagnetic-shielding molded object, which is a part member or a housing of an electric or electronic

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apparatus, an office automation apparatus, a household electric appliance or a medical apparatus.

36. (withdrawn) An electromagnetic-shielding molded object, according to claim 35, wherein said first structural member is positioned at least at a portion of a top face portion of said housing, and said second structural member is positioned at a member including any one or more of a frame, boss, rib, hinge and runner of said housing.

37. (withdrawn) A process for producing an electromagnetic-shielding molded object as set forth in claim 27, comprising a first step of inserting a first structural member produced by molding beforehand, into a mold and a second step of injecting a thermoplastic resin composition to form a second structural member, to the first structural member inserted in said mold, for integrating said second structural member with said first structural member.

38. (withdrawn) A process for producing an electromagnetic-shielding molded object as set forth in claim 27, comprising the step of integrating a first structural member produced by molding

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beforehand and a second structural member produced by injection molding beforehand, by means of ultrasonic welding.

39. (currently amended) A layered product having first and second opposed surfaces and comprising:

(a) a thermosetting resin layer forming said first opposed surface,

(b) a thermoplastic resin layer forming at least a portion of said second opposed surface, and

(c) reinforcing continuous filaments arranged in one direction in said layered product;

wherein,

(d) said thermoplastic resin layer and said thermosetting resin layer are integrated with each other to form a two-layer structure having a continuous rugged interface,

(e) a portion of said filaments are included in both of said thermosetting resin layer and said thermoplastic resin layer through said continuous rugged interface, and

(f) said continuous rugged interface is formed between [an] a maximum innermost filament in the resin of said thermoplastic resin layer in the region where the thickness of the resin of said thermoplastic resin layer from the surface of the

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~~thermoplastic resin layer second opposed surface~~ is largest and an outermost ~~a minimum innermost~~ filament in the resin of said thermoplastic resin layer in the region where the thickness of the resin of said thermoplastic resin layer from the ~~surface of the~~ thermoplastic resin layer ~~second opposed surface~~ is smallest;

and wherein,

(g) a distance between an outermost ~~the maximum innermost~~ filament in said filaments in the resin of said thermoplastic resin layer in the thickness direction thereof and the ~~minimum innermost~~ filament ~~in said filaments in contact with the resin of said thermoplastic resin layer in the region where the thickness of the resin of said thermoplastic resin layer from the surface of said thermoplastic resin layer is largest~~ is 10 μ m or more.